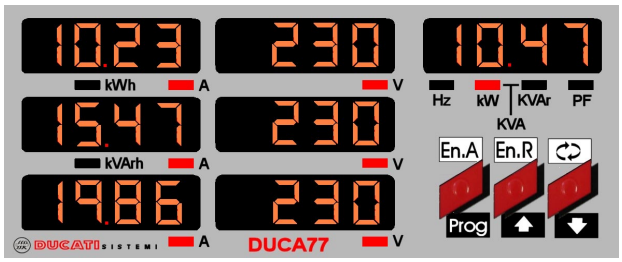
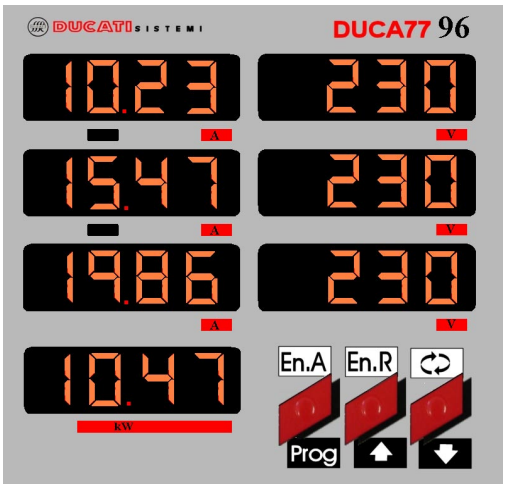
DUCATI SISTEMI

DUCA77 / DUCA77-96

MANUALE UTENTE

USER'S MANUAL





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1. Introduction

This manual contains technical information and cautions for the user in order to assure a correct use of the instrument and its good maintenance in safety conditions to obtain the best performance.

The installation of the instrument must be executed by qualified person after carefully reading this manual.

This symbol identifies all the caution for a correct and safety use of instrument as well as for the operator.

The manufacturer certifies that the instrument DUCA77 is made according to the European Directive 89/336/EEC (EMC) and 73/23/EEC (LVD) and following updates.

2. Description

The instrument **DUCA77** is a DIN rail mounting (6 modules) instrument; the corresponding 96x96mm panel mounting version is named **DUCA77-96**. The DUCA77 is the "***at-a-glance***" instrument, since provides the contemporary visualisation of the main three-phase electrical plants parameters (3 voltages and 3 currents), including the three-phase Active Energy and the three-phase Reactive Energy. The DUCA77 includes moreover four independents counters for active and reactive energies, absorbed or generated from the user (co-generated energy measurements); in fact it is a 4-quadrant instrument.

Its main feature is to provide immediately, through the visualisation on 7 displays with 4-digit figures each, a complete description of the actual situation of the three-phase connected power line. In fact, in the main screen, are visualised all the voltage and current values of the power line for each phase, including the frequency. The DUCA77 can be connected to the medium voltage line, since the ratio of the voltage and current transformer can be programmed up to display 9999Ampere and 9999Volt maximum, while energies can be displayed with a maximum of 8 digits. The DUCA77 provides moreover the recognition and visualisation of Voltage Dips occurrences or situations of *low*-power-supply.

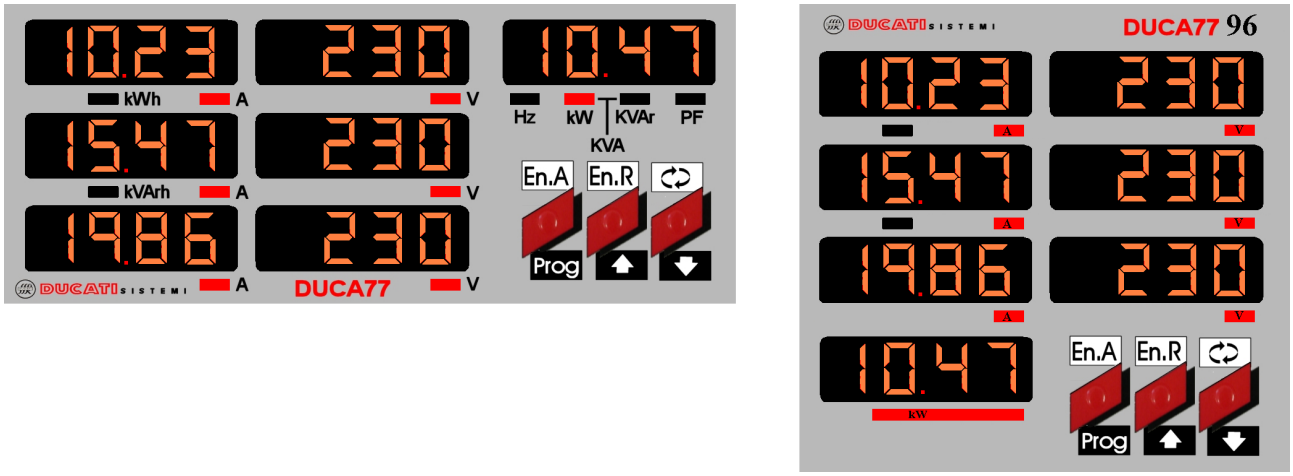

Figure 1: Front view of the 6-DIN rail mounting instrument and the 96x96mm panel mounting version

3. Dimensions and installation

For the two instrument's dimensions refers to the following figures:

DIN RAIL MOUNTING MODEL

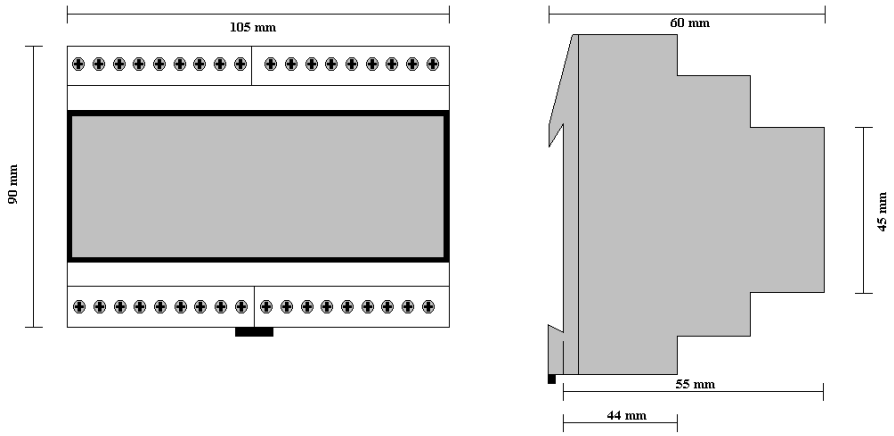

Figure 2: DUCA77 dimensions (DIN rail mounting version)

96 X 96mm PANEL MOUNTING MODEL: DIMENSIONS AND PANEL-BORE

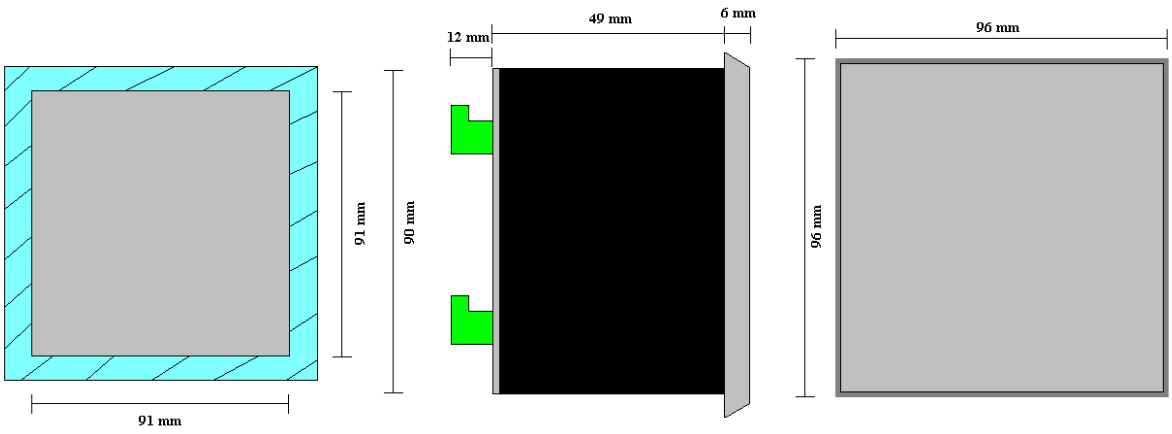

Figure 3: Dimensions and panel-bore of the DUCA77-96 (96x96mm panel mounting version)

In the 96x96 panel mounting version there are two bushes used with a M3 dice in the back of the instrument, used to install the instrument on the panel.

4. Notes for Wiring

General notes

MAKE ALL CONNECTIONS WITHOUT any VOLTAGE APPLIED TO THE INSTRUMENT.

Voltage input

ALWAYS VERIFY THE CORRECT VOLTAGE INPUTS. BE SURE THIS IS NOT EXCEEDING THE MAXIMUM VALUE SUITABLE FOR THIS INSTRUMENT.

Make connections according to the wiring diagram, be careful to respect the correct phases sequence.

Input current

ALWAYS VERIFY THE CORRECT CURRENT INPUTS. BE SURE THIS IS NOT EXCEEDING THE MAXIMUM VALUE SUITABLE FOR THIS INSTRUMENT.

Make connections according to the wiring diagram, be careful to respect the correct phases sequence and current direction.

THE CURRENT TRANSDUCER INSIDE OF THE INSTRUMENT ARE SHUNTS, THE NOMINAL CURRENT IS 5A AC RMS, THE MAXIMUM CURRENT IS 10A AC (for 1 minute). BE CAREFUL: AVOID DIRECT CONNECTIONS OF THE INSTRUMENT TO THE POWER LINE WITHOUT THE CURRENT TRANSFORMERS - ALWAYS USE CTs.

BE CAREFUL: NEVER OPEN THE SECONDARY WINDING SIDE OF THE CURRENT TRANSFORMER UNLESS THERE IS NO CURRENT ON THE PRIMARY SIDE WIRES. IF THIS IS NOT POSSIBLE, MAKE A SHORT CIRCUIT ON THE SECONDARY SIDE BEFORE OPENING THE CIRCUIT.

4.1 Terminal blocks

The DUCA77-96 is equipped with two extractable terminal blocks M1 and M2 (wire screwing); the maximum current rating is 16A, the connection is fitted for 2,5sqmm flexible wire (4sqmm non flexible wire). The maximum rated voltage is 500Vrms, insulation 3kVrms / 1 minute (IMQ-UL), fire class V0-UL94.

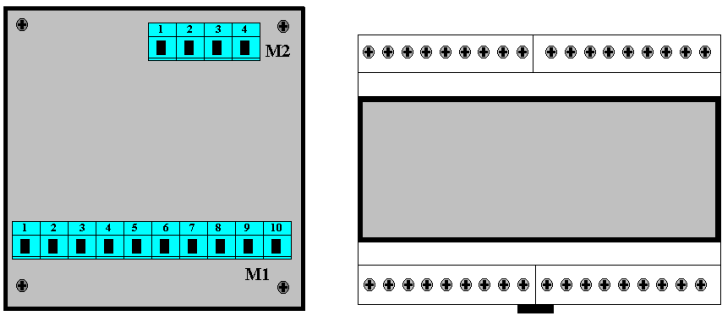

Figure 4: Terminal blocks layout on the two instruments versions

TERMINAL BLOCKS		
Value	**DUCA77-96 (96x96 model) Number of terminal block**	**DUCA77 (DIN rail model) Number of terminal block**
Power supply		
0V	M2 – 4	19
115V	M2 – 3	21
230V	M2 – 2	23
400V	M2 – 1	25
Voltmeter inputs		
(R) L1	M1 – 10	1
(S) L2	M1 – 7	7
(T) L3	M1 – 4	12
N	M1 – 1	18
Secondary CT		
L1 – S1	M1 – 8	5
L1 – S2	M1 – 9	3
L2 – S1	M1 – 5	10
L2 – S2	M1 – 6	9
L3 – S1	M1 – 2	16
L3 – S2	M1 – 3	14
Note: all the CT's **S1** terminals must be connected to the **N**eutral pin	**Note**: M1 – 8, M1 – 5, M1 – 2 must be connected to the **N**eutral pin	**Note**: the terminal blocks 5 – 10 – 16 must be connected to the **N**eutral pin

Figure 5: Terminal blocks table

5. Wiring diagram up to 500Vac three-phase (3Ø+N) with 3 CT

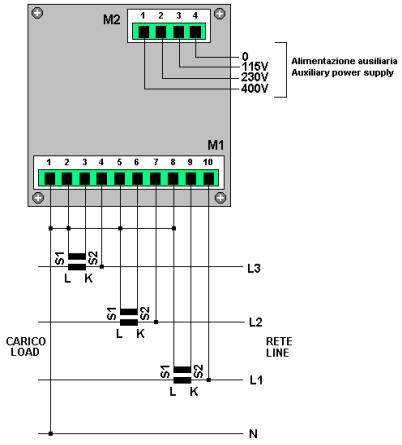

Figure 6: Connection up to 500V AC three-phase voltage, 3 phases + N with 3 CT

NOTE: the connection is the same for the **DUCA77**, following the same order.

6. Wiring diagram up to 500Vac three-phase (3Ø+N) with 3 VT and 3 CT

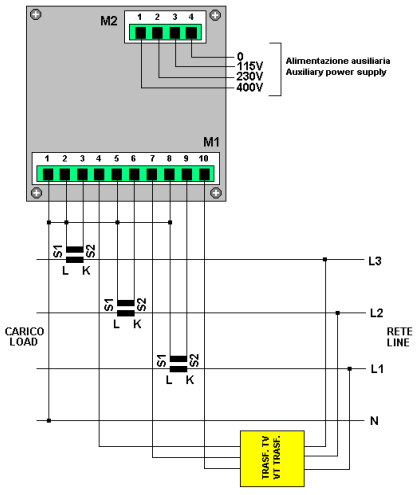

Figure 7: Connection over 500V AC three-phase voltage, 3 phases + N with 3 VT and 3 CT

NOTE: the connection is the same for the **DUCA77**, following the same order.

7. Wiring diagram up to 500Vac three-phase (3Ø+N) with 2 CT

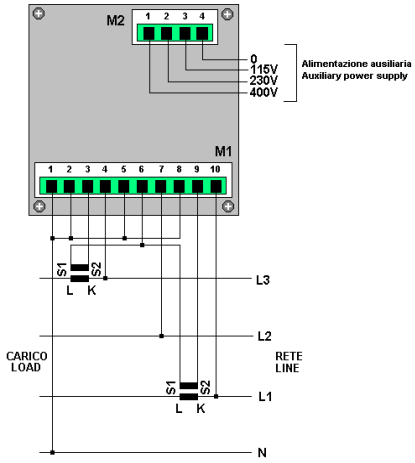

Figure 8: Connection up to 500V AC three-phase voltage, 3 phases + N with 2 CT

NOTE: the connection is the same for the **DUCA77**, following the same order.

8. Wiring diagram over 500V AC three-phase (3Ø+N) with 3 VT and 2 CT

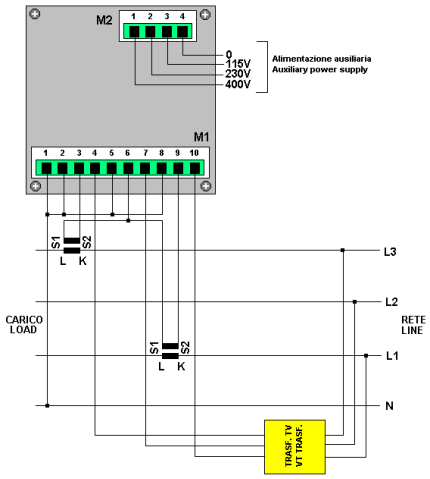

Figure 9: Connection over 500V AC three-phase voltage, 3 phases + N with 3 VT and 2 CT

NOTE: the connection is the same for the **DUCA77**, following the same order.

9. Setup menu

After pressing contemporary the keys "▲" and "▼" the instrument enters the parameters configuration menu, showing on the upper display "**MEASURE**" and on the lower display "**PROG**"; the two central displays are clear. In the following figure (see Figure 10) it is shown the **interface** for the panel mounting model DUCA77-96, remembering that it **is the same for the corresponding DIN rail mounting version (DUCA77)**.

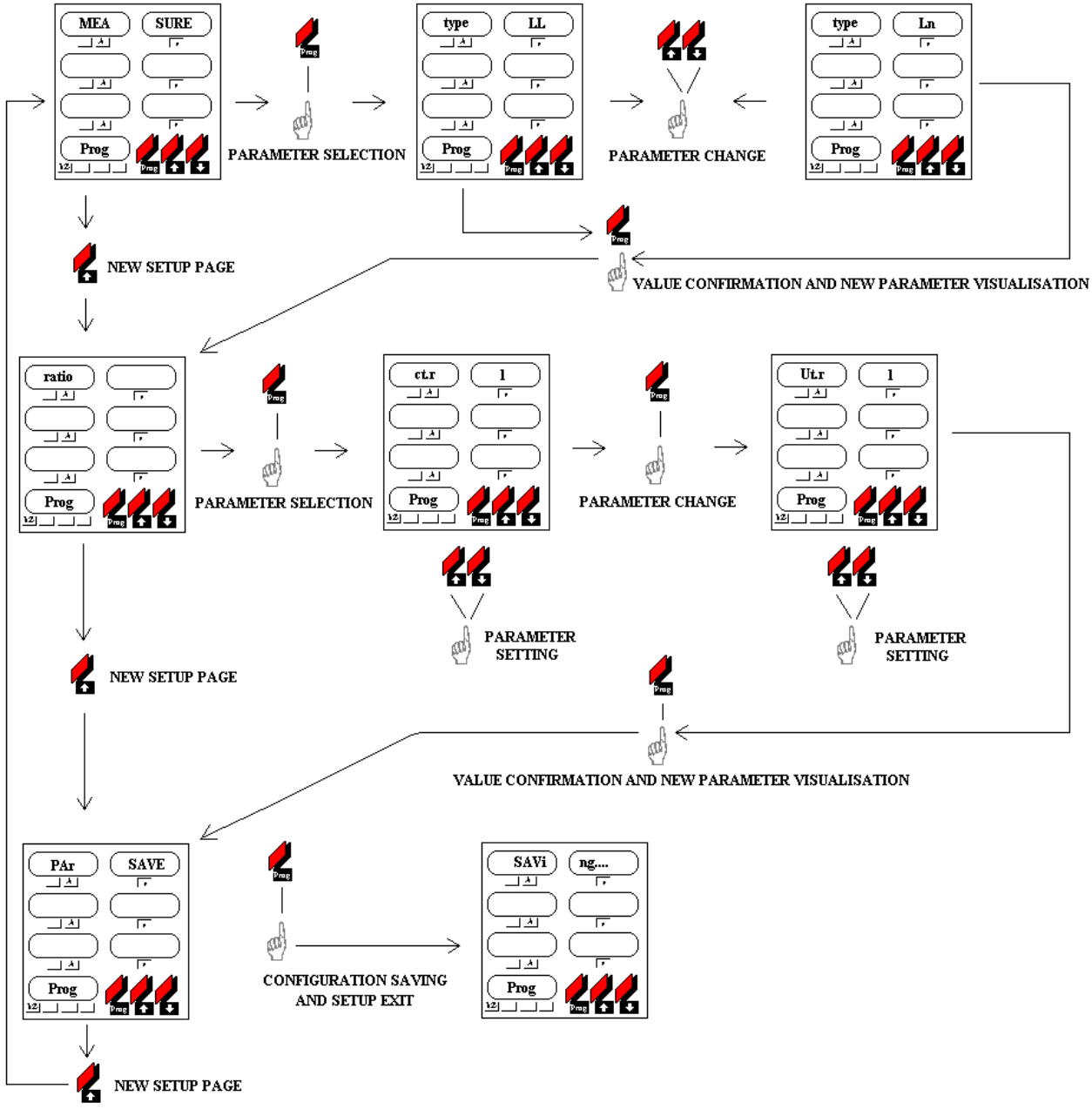

Figure 10: Pages sequence of the setup menu

From every setup page, pressing the "Prog" key, you have the possibility to modify the parameter, using the "▲" or "▼" keys. When the value is modified you must confirm the selection pressing the "Prog" key again. The confirmation allows to access to the next parameter. All the modified parameters are stored in the EEPROM. At the power on the DUCA77 verifies the integrity of the stored parameters, and in case unfortunately these parameters are corrupted, the 7-th display will show "Prog": in this case the user should repeat the configuration procedure. After this, if the error will recur again, it could be necessary to contact your local distributor or Ducati to agree the shipment of the instrument for repair.

9.1 Parameters table and related functions

Parameter	*Visualisation*	*Range*	*Default*	*Function*
Measure	**LL** **Ln**		LL	Voltage measurement mode LL = Phase-Phase Ln = Phase-Neutral
Ratio CT ratio VT ratio	 **ct.r** **Ut.r**	 1÷4000 1÷100	 1 1	CT and VT ratio
Par.SAVE	**SAVIng…**			Modifications saving and setup menu exit

Note for CT and VT programmable ratio: in this parameter you must set the transformer ratio. For example, if you have a CT transformer type "2000/5" it must be set **400** that is the ratio 2000/5=400.

9.2 Energy counters reset

From the measurement menu is possible to reset the energy counters proceeding as follow. After pressing the "▲" and "▼" keys, the upper display of the instrument shows "**MEASURE**" and the lower one shows "Prog". Now press the "Prog" and "▲" keys together to reset the energy counters; press then repeatedly the "Prog" key to exit the setup menu.

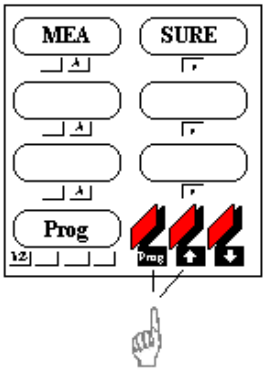

Figure 11: Energy counters reset (keys "Prog" and "▲" together)

10. Measurements Visualisation menu

10.1 Active and Reactive Energy pages

Press the **"En.A"** key to visualise the **Absorbed** Active Energy**:** the "**kWh**" led is turned-on fixed. Press the **"En.A"** key again to visualise the **Generated** Active Energy: the "**kWh**" led is flashing. The Active Energy is visualised on the first two displays, so to have up to 8 digits available for the value display. Press the **"En.A"** key again to return to the phase L1 voltage and current visualisation. The reading has a resolution of 0,1kWh.

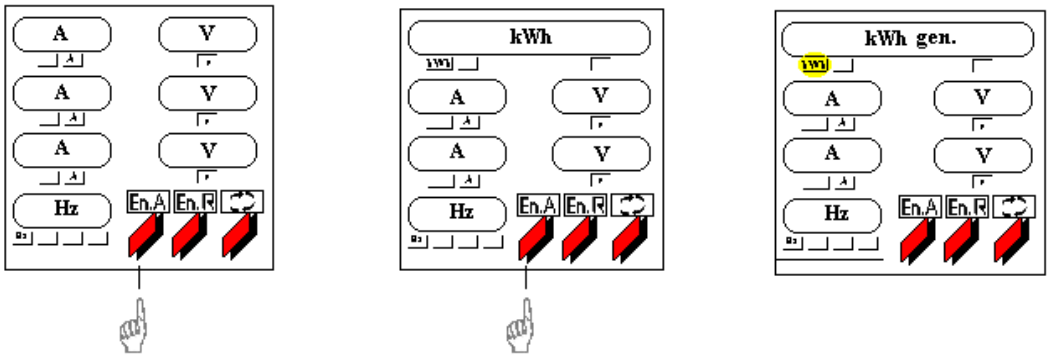

Figure 12: Generated and absorbed Active Energy counter page (key "En.A")

Press the **"En.R"** key to visualise the **Absorbed** Reactive Energy: the led "**kVArh**" is turned-on fixed. Press the **"En.R"** key again to visualise the **Generated** Reactive Energy: the led "**kVArh**" is flashing. The Reactive Energy is visualised on the second two displays, so to have up to 8 digits available for the value display. Press the **"En.R"** key again to return to the phase L2 voltage and current visualisation. The reading has a resolution of 0,1kVArh.

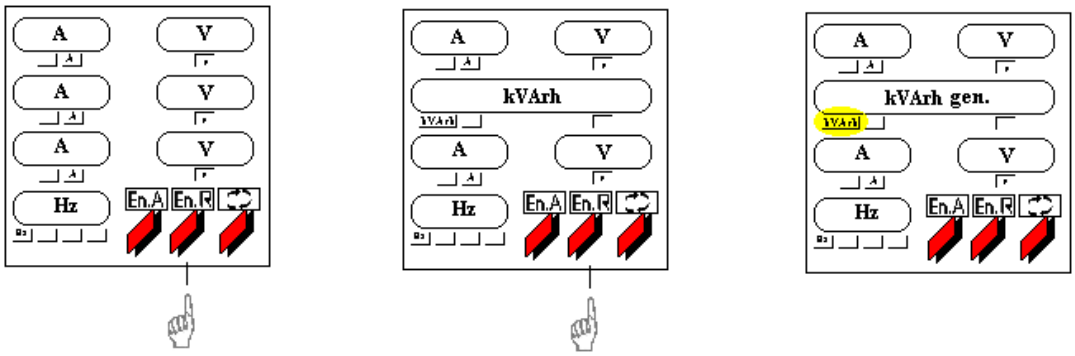

Figure 13: Generated and absorbed Reactive Energy counter page (key "En.R")

Note: During the visualisation of the **Co-generated** Energy, the measurement units kWh o kVArh are **flashing** continuously.

10.2 7-th display measurements page

From the first measurements page, where 3 voltages and 3 currents for each phase are visualised, by pressing the "↻" key, is possible to scan on the 7-th display 5 different measurements. This measurements are summarised for simplicity in the following table (under the 7th display all the different symbols, corresponding to the selected measurement, will be turned-on in succession):

Parameters visualised in succession on the 7-th display pressing the "↻" key	
Parameter	***Visualised symbol***
Frequency of the three-phase electrical line	Hz
Three-phase Active Power	kW
Three-phase Reactive Power	kVAr
Three-phase Apparent Power	kW e kVAr (turned-on together)
Power Factor	PF

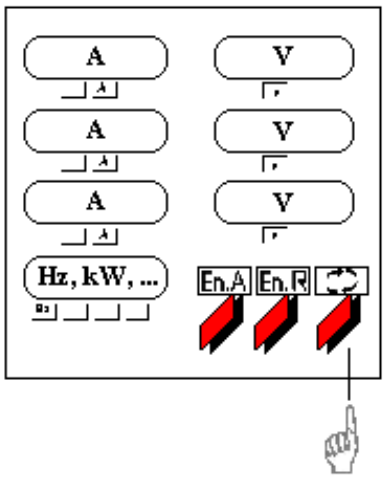

Figure 14: 7-th display measurements visualisation (key "↻")

10.3 Overflow management visualisation

When a single measurement is greater than the maximum displayable value, then it will be displayed **flashing**[i] independently from the others.

[i] In case of *overflow*, the less significant digits are truncated

10.4 Voltage Dips and Low-power-supply visualisation

If during the normal operation the nominal power supply 230Vac of the instrument decreases below a threshold of about 180÷190Vac (different thresholds proportional the other nominal power supply voltages 115Vac and 400Vac), the instrument saves all the parameters, suspends all the activities and shows on the upper display "**SAVing**". If the voltage restores to normal values, the DUCA77 restarts working regularly again, but the 7-th display will show ***Roff*** to indicate the previous mains dip. This visualisation remain until pressing the "[⟲]" key.

11. Performances and technical characteristics

11.1 Displayable measurements

- Voltage between phases (L-L), maximum displayable value 9999V
- Voltage-to-Neutral for each phase (L-N), maximum displayable value 9999V
- Current for each phase, maximum displayable value 9999A
- three-phase Active Power (with its sign), three-phase Reactive Power, three-phase Apparent Power
- three-phase Active Energy (generated and absorbed) up to 8 digit (resolution 0,1kWh, maximum displayable value 9999999,9kWh)
- Reactive three-phase Energy (generated and absorbed) up to 8 digit (resolution 0,1kVArh, maximum displayable value 999999,9kVArh)
- Co-generation measurements: measurement on 4 independent counters of Active and Reactive energies generated and absorbed
- Frequency from 30Hz to 200Hz
- Power Factor PF (cosFI) with resolution of ±0,01, with 4-quadrant measurement and with conventional sign for Inductive and Capacitive
- All the measurements are evaluated in "*true RMS*" mode
- Display overflow management (with flashing indication)

11.2 Simultaneous displayable measurements

- V – A on 3 phases + kW or kVAr or kVA or Hz or PF on the 7-th display (scan with "[⟲]" key)
- kWh (absorbed/generated) + V – A for 2 phases (phase L2 and L3) + kW or kVAr or kVA or Hz or PF
- kVArh (absorbed/generated) + V – A for 2 phases (phase L1 and L3) + kW or kVAr or kVA or Hz or PF
- kWh (absorbed/generated) + kVArh (absorbed/generated) + V-A for phase L3 + kW or kVAr or kVA or Hz or PF

11.3 Voltmeter and ammeter inputs

- 3 for voltage in the range 20÷300Vrms (L-N), maximum non destructive 1000Vrms for one minute; input load 0,08VA for each phase
- 1 for Neutral
- 3 couples (S1 and S2) for current in the range 20mA÷5Arms, permanent overload 6Arms; maximum non destructive 10Aca for one minute; burden/dispersed power 0,025VA for each input with Imax = 5Arms, *current inputs through internal shunts and* ***using external CTs***
- Insulation = 2,2kV for one minute
- VT = programmable ratio from 1 to 100
- CT = "../5A" with programmable ratio from 1 to 4000

11.4 Accuracy of the measurements

- Accuracy Class = 1
- Accuracy of primary measurements:
  - √ Voltage 0,5% ±1 digit in the range 100÷440V_{LL} (58÷254V_{LN})
  - √ 1% ±1 digit in the range 440÷500V_{LL} (254÷288V_{LN})
  - √ Current 0,5% ±1 digit in the range 100mA÷5Arms

11.5 Interfaces

- **7** display / **7** segment with 4-digit figure each (height of characters 10mm)
- 3 user friendly keys with incremental autoscroll speed to scan:
  - √ the measurements: indication En.A, En.R and ↻
  - √ setup the configuration parameters: indication Prog, ▲ and ▼

11.6 Power supply

- 115 – 230 – 400 Vac ±15%, 45÷65Hz, absorbed power < 7VA
- Fit external fuse T0,1A
- Recognition and display of voltage dips and low-power supply (function Roff)

11.7 Operating conditions

- Working temperature: from 0°C to 50°C
- Storage temperature: from -10°C to 60°C
- Relative humidity 90% without condense

11.8 Protection

- IP50 on the front panel
- IP20 on the terminal blocks

11.9 Miscellaneous

- Possibility of 96x96 panel mounting version or DIN rail mounting version (6 modules) with the same features
- Connections with extractable terminal blocks IMQ-UL, fire class V0-UL94 (only model 96x96)
  - √ maximum 16A
  - √ 2,5sqmm flexible wire (4sqmm non flexible wire)
  - √ insulation 500Vrms between terminals
  - √ 3kVrms / 1 minute
- Case in NORYL, fire class UL94 V2
  - √ Front panel in polyester with texturing treatment
- Dimensions:
  - √ 96x96model = 96mm x 96mm x 75mm (LxHxW)
  - √ DIN rail model = 105mm x 90mm x 73mm (LxHxW)
- Weight: about 350g

11.10 Normative reference

The instrument is compliant with the following EU standard directives:

CE

- ELECTRICAL SAFETY – Low Voltage Directive No. 73/23/CEE
- ELECTROMAGNETIC COMPATIBILITY – Directive No. 89/336/CEE

DUCATI Sistemi S. p. A. denies any responsibility for damage or personal injury caused by the improper or erroneous use of this equipment.

This documentation may be subject to modification without prior notice.

This manual refers to the firmware versions released in April 2004 and successive.

Documentation code: DUCA77_V14_ENG.doc – Version 1.4 – June 2004.

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